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EXAMINER	
LEE, JOHN W	

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2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/538,150	WATSON ET AL.	
	Examiner	Art Unit	
	JOHN Wahnkyo LEE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) *19,21,23 and 24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18, 20, 22 and 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The response received on 12 February 2008 has been placed in the file and was considered by the examiner. An action on the merits follows.

Response to Amendment

2. The applicant's amendments filed on 17 January 2008 have been fully considered.

I. THE ABSTRACT

Applicant's arguments to the objection to the abstract have been fully considered and are persuasive by shortening the abstract. The objection to the abstract is hereby withdrawn

II. THE SECTION 101 REJECTION OF CLAIM 25

Applicant's arguments to the rejection under 35 U.S.C. § 101 with respect to claim 25 has been fully considered and are persuasive by the applicant amending the claim. The rejection under 35 U.S.C. § 101 with respect to claim 25 is hereby withdrawn

III. THE SECTION 112, 2nd PARAGRAPH REJECTION OF CLAIM 4

Applicant's arguments to the rejection under 35 U.S.C. § 112 with respect to claim 4 has been fully considered and are persuasive by the applicant amending the claim. The rejection under 35 U.S.C. § 112 with respect to claim 4 is hereby withdrawn

Response to Arguments

3. Applicant's arguments with respect to claims 1-18, 20, 22 and 25 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 6-9, 11, 14, 17-18, 20, 22, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Madachy et al. ("Image Analysis For Automatic classification of mitotic cervical cells").

Regarding claim 1, Madachy teaches a method for the automated analysis of a digital image (abstract, "digital image analysis"; INTRODUCTION, page 372) comprising an array of pixels (TEXTURE, pages 373, "pixel") including the successive steps of: (a) identifying (abstract, "identifying miotic …") the locations of objects within the image which have specified intensity (abstract, "optical density") and size (abstract, "geometrical measures") characteristics; (b) defining respective regions of specified extent within the image around respective said locations (SHAPE, pages 373, lines 28-58); (c) deriving from the data within respective said regions one or more respective closed contours comprising points of equal intensities (TEXTURE, pages 373, "subregions based on density … black and white pixels…); and (d) estimating the curvature of at least one respective said contour within respective said regions and producing a measure of any concavity thereof (SHAPE, pages 373, "R(i)" and "curvature").

Regarding claim 6, Madachy discloses following step (a): selecting an intensity threshold (TEXTURE, pages 373, “15%”) related to the mean intensity of pixels (TEXTURE, pages 373, “mean value”) within the image in neighbourhoods of said locations (TEXTURE, page 373); creating a binary image according to whether pixels in the first-mentioned image (Figure 2; TEXTURE, pages 373) are above or below said threshold (TEXTURE, pages 373, “15%”); identifying regions in the binary image composed of connected pixels which are below said threshold in the first-mentioned image (Figure 2; TEXTURE, page 373, “white pixels”); and rejecting from further analysis those objects which correspond to such regions in the binary image which fall below a specified size or thickness (TEXTURE, page 373, “larger than .. “).

Regarding claim 7, Madachy teaches wherein step (c) comprises, for respective said regions (TEXTURE, page 373, “subregions”) deriving respective first (Figure 2; TEXTURE, page 373, “white pixel region”) and second said contours (TEXTURE, page 373, “black pixel region”) having respectively lower (TEXTURE, page 373, “optical density being 15% lower than mean value”) and higher resolutions (TEXTURE, page 373, “optical density being 15% greater than mean value”), determining whether the sizes and locations of said first and second contours are consistent within specified criteria and, if so consistent, selecting said second contour for step (d) (TEXTURE, page 373, “the black and white regions are … regions larger than 2 … operation.”).
Regarding claim 8, Madachy teaches the first said contour is derived by: seeking within the region one or more contours of respective specified intensities (Figure 2; TEXTURE, page 373, “white pixel region” and “black pixel region”); determining whether the or each

such contour is a closed contour and meets specified location, size and/or intensity orientation criteria (METHOD, “continuous contours … fixed size”; TEXTURE, page 373, “the black and white regions are … regions larger than 2 … operation.”); and if more than one such contour is a closed contour and meets such criteria, selecting from the same the contour of the lowest intensity (Figure 2; TEXTURE, page 373, “white pixel region”).

Regarding claim 9, Madachy teaches wherein said specified intensities (Figure 2; TEXTURE, page 373, “white pixel region”) are no greater than that which corresponds to the contour of highest edge strength within the respective region (TEXTURE, page 373, “black pixel region”).

Regarding claim 11, Madachy discloses the second said contour is derived by: seeking within the region a plurality of contours of respective specified intensities ranging between the lowest and highest intensities within the region (Figure 2; TEXTURE, page 373, “white pixel region” and “black pixel region”); determining whether each such contour is a closed contour and meets specified location, size and/or intensity orientation criteria (METHOD, “continuous contours … fixed size”; TEXTURE, page 373, “the black and white regions are … regions larger than 2 … operation.”); and if more than one such contour is a closed contour and meets such criteria, selecting from the same the contour having the highest edge strength (Figure 2; TEXTURE, page 373, “white pixel region”).

Regarding claim 14, Madachy discloses further comprising the step of: (e) classifying objects into one of at least two classes (CELL CLASSIFICATION, page 373, “parameters”) in accordance with a function of said measure of concavity of a contour (SHAPE, page 373, “R(i)”) corresponding to the respective object and a measure of the mean intensity (TEXTURE, page 373, “mean value”) of the respective object.

Regarding claim 17, Madachy discloses further comprising the step of: (f) counting the number of objects classified into a specified one of said classes (PREVIOUS EFFORTS, page 372, “counted mitoses in breast cancer …”).

Regarding claim 18, Madachy discloses wherein the image is of a histological or cytology specimen or of a soil sample (INTRODUCTION, page 372, “pre-scored specimens”).

Regarding claim 20, Madachy discloses the image being of a section of breast tissue and said specified class is identified as the class of mitotic epithelial cell nuclei (PREVIOUS EFFORT, page 372, “counted mitoses in breast caner …”).

Regarding claim 22, Madachy discloses a method for the automated identification of mitotic activity from a digital image (abstract, “digital image analysis” and “mitotic cells”; INTRODUCTION, page 372) of a histological specimen (INTRODUCTION, page 372, “pre-scored specimens”), including the steps of: (a) identifying (abstract, “identifying miotic …”) the locations of objects within the image which have specified intensity (abstract, “optical density”) and size (abstract, “geometrical measures”) characteristics associated with epithelial cell nuclei (pages 372-374); (b) defining regions of specified extent within the image which contain

respective said objects (SHAPE, pages 373, lines 28-58); (c) deriving from the data within respective said regions one or more respective closed contours comprising points of equal intensities (TEXTURE, pages 373, “subregions based on density … black and white pixels…); and (d) estimating the curvature of at least one respective said contour within respective said regions at least to produce a measure of any concavity thereof (SHAPE, pages 373, “R(i)” and “curvature”). (e) classifying objects as representing mitotic cell nuclei as a function of at least said measure of concavity of a contour corresponding to the respective object (TABLES 1 and 2; page 374, “parameter statistics” and “classification”).

Regarding claim 25, Madachy discloses a computer program comprising instructions to cause a computer to execute a method according to claim 1 (METHOD, page 373, “Gould/Denaza IP8500 image processor on a VAX host”).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2-5, 10, and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madachy et al. (“Image Analysis For Automatic classification of mitotic cervical cells”) in view of Netsch et al. (“Scale-Space Signatures for the Detection Clustered Microclacifications in Digital Mammograms”).

Regarding claim 2, Madachy teaches all the previous claim limitation except the one specified in claim 2. However, Netsch teaches wherein step (a) comprising the application of a radially-symmetric difference filter with zero mean (Fig. 3; equations (1)-(4); section III. A. Motivation and Outline, page 776, “circularly-symmetric Gaussian function”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Netch’s method in Madachy’s method to provide automated detection of microcalcifications as suggested by Netch (abstract).

Regarding claim 3, Netch further teaches the image is filtered at a plurality of resolutions of increasing scale (Figure 4; section III. A Motivation and Outline; pages 776-777, “scales h=1, …”).

Regarding claim 4, Netch further teaches locations are identified in accordance with the locations of respective local extrema (abstract, “local maxima”) in the output of said filter (abstract, “possible locations of … local maxima … filtered image …”).

Regarding claim 5, Netch further teaches including the step of sorting, in order of intensity (section III A. Motivations and Outline, “range of scales”), local extrema (section III A. Motivations and Outline, “local maxima”) in the output of said filter (abstract, “possible locations of … local maxima … filtered image …”) and selecting for further analysis only those objects which correspond to a specified proportion of said extrema in such order (section III A. Motivations and Outline, “Detection … filter … threshold”).

Regarding claim 10, Netch further teaches wherein step (a) comprising the application of a radially-svmmetric difference filter with zero mean (Fig. 3; equations (1)-(4); section III. A. Motivation and Outline, page 776, “circularly-symmetric Gaussian function”) and said first contour is derived by seeking one or more contours in the output of said filter for the respective region and said specified intensities are no greater than the zero level in such output (Figs. 3-5; equations (1)-(6); section III. A. Motivation and Outline, page 776, “circularly-symmetric Gaussian function”).

Regarding claim 12, Netch further teaches step (d) including the application of a Probability Density Association Filter to respective said contours (Fig. 3; equations (1)-(4); section III. A. Motivation and Outline, page 776, “circularly-symmetric Gaussian function” and “Gaussian function is a type of a probability density function”).

Regarding claim 13, Netch further teaches step (d) comprising, for respective said contours (III D. Feature Estimation by Signatures; pages 778, “cylinder”): measuring the curvature of the contour at a plurality of points around the contour, convexity and concavity being of opposite sign (equation (7); III D. Feature Estimation by Signatures; pages 778, “cylinder”); setting convex values of such curvature to zero (equation (7); III D. Feature Estimation by Signatures; pages 778, “cylinder”); plotting resultant values of curvature at said points against a measure of the distance of the respective point along the contour (Figs. 7-10); and computing as said measure of concavity the line integral of such plot (equations (7)-(16)).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Madachy et al. (“Image Analysis For Automatic classification of mitotic cervical cells”) in view of Soni et al. (US 5,363,850).

Regarding claim 15, Madachy teaches all the previous claim limitation except the one specified in claim 15. However, Soni discloses using a Fisher classifier (claims 5 and 6, “Fisher classification”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Soni’s invention in Madachy’s method to provide high resolution as suggested by Soni (col. 1, lines 8-10).

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Madachy et al. (“Image Analysis For Automatic classification of mitotic cervical cells”) in view of DeLong (US 2002/0012466).

Regarding claim 16, Madachy teaches all the previous claim limitation except the one specified in claim 16. However, DeLong discloses the intensities of respective objects are normalised prior to step (e) (Fig. 2; claim 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use DeLong’s invention in Madachy’s method to provide an image analysis process which can cyclically and interactively approximate the wished and ideas of a user without the user having to have detailed knowledge of the image processing itself (paragraph [0006]).

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN Wahnkyo LEE whose telephone number is (571)272-9554. The examiner can normally be reached on Monday - Friday (Alt.) 7:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jingge Wu/
Supervisory Patent Examiner, Art Unit 2624

/John Wahnkyo Lee/
Examiner, Art Unit 2624